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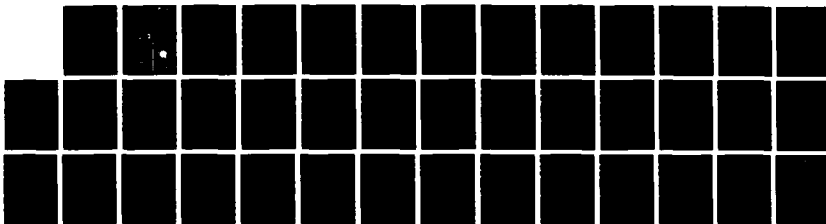
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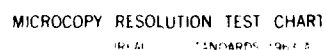
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**THE DEVELOPMENT OF SOVIET "TACTICAL" AVIATION
IN THE POSTWAR PERIOD: TECHNOLOGICAL CHANGE,
ORGANIZATIONAL INNOVATION AND DOCTRINAL CONTINUITY***

by

**Dr. Jacob W. Kipp
Soviet Army Studies Office
U.S. Army Combined Arms Center
Fort Leavenworth, Kansas**

*The views expressed here are those of the Soviet Army Studies Office. They should not necessarily be construed as validated threat doctrine.

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THE DEVELOPMENT OF SOVIET "TACTICAL" AVIATION IN THE POSTWAR PERIOD: TECHNOLOGICAL CHANGE, ORGANIZATIONAL INNOVATION AND DOCTRINAL CONTINUITY

To steal a title from Von Hardesty's recent fine volume of the Soviet Air Forces in the Great Patriotic War, the development of Soviet "tactical" aviation in the postwar period might well be entitled "Red Phoenix Revisited." In this case, however, Marx's famous injunction that great historical events repeat themselves as farce seems hardly to apply. The resurgence of Soviet "tactical" aviation in all its forms represents a formidable military capability, which has enhanced the Soviet military's ability to conduct theater-strategic operations relying upon conventional combined arms. The path to these capabilities has not been a direct one and can best be understood within the context of the development of Soviet military art in the postwar period.

At the same time it is critical for our purposes to make quite clear the inadequacy of our conventional terms of reference in dealing with the Soviet air forces [voenno-vozdushnye sily] and Soviet military doctrine [voennaia doktrina], which is not a cognate for what we mean when we use the term military doctrine. Crucial to our understanding of the postwar development of the role of the Soviet air forces in postwar military doctrine is to recognize the unique and special role which operational art [operativnoe iskusstvo] plays in linking together tactics and strategy within the context of modern industrial war. For the purposes of this paper Soviet air forces will be addressed within both the operational and tactical contexts, with much greater

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emphasis on the former for it is the level of war where aviation has its most decisive impact upon ground combat and where the Soviets recognize the need to develop cooperation [vziamodeistvie] among combat arms and branches of the armed forces.

When we speak of Soviet air forces we have in mind a number of institutions, which are structured functionally and exist in a form of dual subordination to their branch which provides training, supply, and logistical support and a command authority which controls the combat employment of such units. The command authority exercising such control has traditionally identified the air combat units operational and tactical subordination. Thus, strategic air reserves have been referred to as Reserves of the Supreme High Command, which in wartime has meant direct subordination to Stavka control. During the Great Patriotic War Stavka kept control of Soviet Long-Range Aviation but employed it to support deeper strikes (up to 400 km from the line of contact in multi-front operations rather than using it for strategic bombardment of what the Soviets then referred to as the "state rear" [gosudarstvennyi tyl]). In December 1944 Stavka Long-Range Aviation was reorganized into the 18th Air Army and subordinated directly to the Command of the Air Forces. Frontal aviation [frontovaya aviatsiia] refers to air assets directly under the authority of a front commander and earmarked to strike at the enemy at operational depths. Since the 1930s Soviet theorists had postulated the need for each front commander to have his own air

army dedicated to such strikes at operational depths (out to roughly 200 to 300 km from the line of contact). In some operations during the final phase of the war fronts were assigned two air armies, depending upon the nature of the theater, the depth and nature of the enemy defenses, the importance of the front's strategic axis (axes), and need to achieve simultaneous suppression of enemy operational reserves. Soviet practice changed during the war when front commanders were able to centralize all air assets under the air armies assigned to them. This allowed the front commander, or stavka representative in the case of multi-front operations to dedicate his air assets to the various missions throughout the depth of the enemy's defenses according to his operational design.¹

Developed in theory before the war and put into practice during the second period of the Great Patriotic War, this "air offensive" [vozdushnoe nastuplenie] reached full maturity in the third and final period of the war when it was employed with great effect during the Belorussian, Jassy-Kishinev, Vistula-Oder, East Prussian, Berlin, and Manchurian operations.²

At the outset of the Great Patriotic War air assets assigned to closer support missions had been directly subordinated to an army commander, hence the designation army aviation [armeiskaia

¹ M. N. Kozhevnikov, Komandovanie i shtab VVS v Velikoi Otechestvennoi voine 1941-1945 gg. (Moscow: Nauka, 1977), 255-256.

² Ibid., pp. 168 ff.

aviatsiia]. Such assets were assigned to carry out missions at operational-tactical depths in cooperation with combined-arms formations. These missions include air support, tactical air reconnaissance, tactical airborne landings, and logistical support of mobile groups, providing the spearhead of the combined-arms formation's advance. Air assets, assigned directly to the tactical battle under corps and divisional command, constituted troop aviation [voiskovaia aviatsiia]. In the 1930s Soviet corps and divisions had their own light planes for artillery spotting and utility missions. However, during the Great Patriotic War both army aviation and troop aviation were abolished and their assets assigned to the air armies of the fronts. This centralization facilitated the massed employment of aviation assets on the most decisive axes in any operation throughout the depth of the defense. Only in the 1960s did army and troop aviation reappear. This time in conjunction with the development of rotary aviation.³

Roughly speaking, there have been four distinct periods of doctrinal development since 1945, during which the composition, organization, and structure of Soviet air forces underwent considerable changes. By the 1980s, along with other technological changes, aviation in all its manifestations had recast operational art. As then Chief of the General Staff N. V. Ogarkov wrote in 1982:

³ 'Voennyi entsiklopedicheskii slovar'. (Moscow: Voenizdat, 1983), pp. 43, 155.

- and finally, the air sphere in combat actions and operations has acquired an ever-growing role, which gives to modern operations a three-dimensional, deep character.⁴

The path to this present situation contained its own share of twists and ironies. That same path also offers some clues relating to the further development of Soviet air forces and their roles in operational art and tactics.

I. THE IMMEDIATE POSTWAR PERIOD, 1945-1954

This period found the Soviet Union in a most difficult situation regarding the development of tactical aviation. On the one hand, Soviet frontal aviation in the form of its air armies had proven to be a most effective instrument in the final period of the Great Patriotic War when it was applied as part of a combined arms force to multi-front, successive deep operations in Eastern Europe and Manchuria.⁵ Air doctrine incorporated the basic assumptions, which had been outlined in Kombrig

⁴ N. V. Ogarkov, Vsegda v gotovnosti k zashchite otechestva (Moscow: Voenizdat, 1982), p. 44. Ogarkov identified four other factors which had shaped the development of military art in the postwar fashion in a fundamental way. These were: the scientific-technical revolution in military affairs, which promoted qualitatively new military technology and weaponry and mandated a search for new methods and methods of employing them; the tempo of technological change has increased, reducing the time between qualitative leaps thus accelerating change in military affairs; the significance of strategic means of conducting war has grown to such an extent that such means can directly influence its course and outcome; and the transformation of the very process of troop control, which have become more integrated and rely upon automated systems.

⁵ M. N. Kozhevnikov, Komandovanie i shtab VVS Sovetskoi Armii v Velikoi Otechestvennoi voine, 1941-1945 gg. (Moscow: Voenizdat, 1977), pp. 164 ff.

Lapchinsky's Vozdushnaia armiia [The Air Army] of 1939, but stressed the centralized control of air assets to ensure the optimal application of air power during the air operation throughout the depths of the enemy's operational defenses. The air instruments of that combined arms team were fighter, ground-attack, and medium-bomber aviation. These aircraft reflected a maturity of design and an optimization of existing technology adapted to the East European theater of operations. The emphasis was upon ruggedness, dependability, and sustainability.

At the same time the pace of technological changes and the emergence of the Cold War forced the Soviet leadership into a major reconsideration of the composition and structure of its air forces. Although Soviet aeronautical specialists had foreseen the development of jet propulsion in the prewar period, the Soviet aircraft industry was in a difficult situation when jet propelled aircraft made their combat appearance with the Luftwaffe in the skies over Germany. As A. S. Yakovlev has made clear, the development of Soviet jet aircraft in the postwar period followed a three-stage process: 1) initially relying upon captured German engines to power first-generation jet aircraft which were hardly more than the airframes of propeller aircraft adapted to the new engines; 2) then came the production of British Nene jet engines under license; and 3) finally, the engine design bureaus of Klimov, Mikulin and Liul'k began to produce Soviet engines for a

generation of fighters, fighter-bombers, medium bombers, and strategic bombers.⁶

The most outstanding aircraft of this postwar generation was the MiG 15 with its swept-back wing, tricycle gear, and heavy armament of one 37 mm and two 23 mm cannon. The origins of the aircraft can be traced to a specific decision by the Central Committee of the Communist Party of the Soviet Union to make jet engine and aircraft development a top national priority. The MiG 15, which benefitted from those engine developments, flew first in 1947 and went into series production in the fall of 1948.⁷ At the same time Soviet aircraft construction bureaus were ordered to address the problem of sonic and super-sonic flight. O. V. Sokolovsky made the first sonic flights in the Soviet Union in December 1948 - January 1949, flying the La-176, an experimental aircraft. In 1949 I. A. Ivashenko flew an MiG 17 at super-sonic speed in level flight, becoming the first aviator in the world to break the sound barrier in level flight flying a combat aircraft.⁸ Jet-propelled fighter-bombers, medium bombers, and strategic bombers were under development by the time of Stalin's death in 1953. The first of these was the Il-28, an all-weather,

⁶ A. S. Iakovlev, 50 let sovetskogo samoletstroeniia (Moscow: Voenizdat, 197), pp. 117-119.

⁷ Bill Gunston, Aircraft of the Soviet Union (London: Osprey Publishing, 1983), pp. 174-175.

⁸ M. M. Kir'ian, ed., Voenno-tekhnicheskii progress i Vooruzhennye Sily SSSR (Moscow: Voenizdat, 1982), pp. 224-225.

medium bomber, designed to provide frontal aviation with the ability to strike deep operational targets.

Hand-in-hand with the development of jet aircraft went a reorganization of Soviet Air Forces in the immediate postwar years. The appearance of atomic weapons and the emerging geo-strategic competition with the United States brought with it renewed interest in long-range aviation. The Air Forces were again divided into Frontal Aviation and long-Range Aviation. The former was by far the numerically larger force, organized into formations and units reflecting functional specialization, i. e., bomber, attack, and fighter aviation, as well as a general category of "aviation of special designation," which embraced reconnaissance, transport, medical and utility aviation.⁹

Long-Range Aviation acquired its first strategic bombers, thanks to the copying of captured B-29s in the design of the Tu-4. Although Soviet interest in long-range aviation remained a feature of aviation development over the next four decades, the Soviets never developed an enthusiasm for strategic bombing as the most effective means for the delivery of deep strikes against the enemy's state rear. In part, this was a result of the geo-strategic situation confronting the USSR, which made forward basing to support such strikes impossible. The low priority for strategic bomber aviation also had its roots in several other factors. First, the Soviet approach to strategic bombardment only came at a time when a competing delivery system, i. e., the

⁹ Ibid., 235-236.

ballistic missile, had already appeared and was under development. Second, given the commanding authority of the Soviet General Staff in formulating military art and science, there was no independent institutional voice to promote strategic bombardment as a definitive element of national military posture or to champion it as the raison d'etre of its existence. Finally, we should note that the Soviet acquisition of atomic and then nuclear weapons did not lend itself to nuclear "fetishism" in the late 1940s or early 1950s. Atomic bombs, while weapons of mass destruction, could not be massed produced. Their military impact, as even keen American observers thought, would be limited to strategic bombardment for an indefinite period.¹⁰

The Soviets responded to the U. S. atomic threat by reorganizing their air defenses. During the Great Patriotic War Soviet Air Defense Forces [Voiska Protivovozdushnoi Oborony] had been organized into four fronts (the Western, Southwestern, Central, and Transcaucasian) and six armies. In 1946 these were reorganized into air defense districts. At the same time a commander of Soviet National Air Defence Forces [Voiska Protivovozdushnoi Oborony Strany] was appointed. He was the immediate subordinate of the Commander of Artillery of the Armed Forces of the Soviet Union. This relationship reflected the fact that tubed artillery still represented the dominant weapon of air defense. In 1948, however, PVO Strany became an independent

¹⁰ Vannevar Bush, Modern Arms and Free Men: A Discussion of the Role of Science in Preserving Democracy (Boston: Simon & Schuster, 1949), pp. 109-110.

branch of the Soviet Armed Forces. United under its command were interceptor aviation, AAA, Troops of the ground observation service, which included radar units and ground observers, search light units, barrage balloon units, and other specialized forces. The entire country was divided into border and interior regions. In this period the conduct of air defense actions in particular region came under the direction of the commanders of the various military districts.¹¹ The importance of air defense of deep targets was reflected in the decision to turn the first production MiG 15s over to Air Defense units and by the shift from a defense of specific targets (point defense) towards an integrated national system, designed to attrition invading bombers through integrated and sustained attacks, what one Soviet author has called "the organization of the air defense operation."¹² While this did not mean that the air defense of ground forces disappeared from Soviet military art, it did mean that top priority in the development of combat means and methods went to defense of the state rear from the U.S. strategic bomber threat. Development of SAM weapons received a high priority owing to this particular threat.

¹¹ Voiska protivovozdushnoi oborony strany: Istoricheskii ocherk (Moscow: Voenizdat, 1968), pp. 349-358.

¹² Kir'ian, Voenno-tekhnicheskii progress i Vooruzhennye Sily SSSR, p.238.

All of these developments in the field of aviation took place at a time when the Soviet General Staff was reformulating its notions of strategic operations conducted by multiple-fronts in a theater of military actions. The most crucial element to this process of working out the means of conducting strategic offensives was the digestion of the lessons learned during the Great Patriotic War itself. The emphasis was upon cooperation [vziamodeistvie] among all branches of the armed forces in the achievement of decisive results. The most important changes in operational art in the immediate postwar period were a recognition for deeper strikes into the enemy defense and an accelerated pace of advance, which was to be achieved by the total mechanization of all ground combat arms and the further development of airborne forces.

In the initial phase of a future war Frontal Aviation was expected to win the battle for command of the air over the most decisive axes and set the stage for a breakthrough and exploitation on the ground, which would end with the encirclement and destruction of the opposing forces.

The air offensive, which included air preparation and air support, was considered the basic means of the operational employment of aviation. Air preparation was divided into preliminary and direct. The main objective of the preliminary air preparation involved the destruction of especially powerful defensive installations and the achievement of command of the air. Direct air preparation coincided in time with the artillery preparation and included the destruction of defensive installations and the suppression of the enemy's system of fire. The depth of the air and artillery actions against the enemy in comparison

with the previous war increased significantly with the greater range and power of the means of destruction.¹³

Thus, the immediate postwar period saw the Soviets try to fit a technologically advanced aviation into their basic design for successive deep operations. The Soviets did, however, acknowledge new missions for aviation in strategic bombardment, employing atomic and later nuclear weapons when they became available, and the development of an integrated system of national air defense. In practice, given the condition of the national economy, the need for immediate demobilization, and the appearance of other competing needs for research and development funding, Frontal Aviation was modernized at a much slower pace than existing doctrine and military art required. This period came to an end in 1953 with the death of Joseph Stalin and the appearance of the first generation of nuclear weapons, which made possible the mass production of weapons of truly mass destruction and set off a search for means and methods of employing such weapons.¹⁴

II. THE SCIENTIFIC-TECHNICAL REVOLUTION IN MILITARY AFFAIRS

The death of Stalin and the emergence of nuclear weapons inaugurated within the Soviet military a profound ferment over the implications of the new technologies of strategic destruction and delivery, i. e., nuclear weapons and ballistic missiles. For

¹³ Ibid., p. 242.

¹⁴ David Holloway, The Soviet Union and the Arms Race (New Haven: Yale University Press, 1983), pp. 28-38.

roughly a decade Soviet military theorists associated with the General Staff viewed this scientific-technical revolution as the negation of past military experience, making the latter irrelevant to the development of military art. From 1955 they were guided by the Party's decision to treat science as an independent element and to accelerate the pace of scientific-technical progress. Operating from a position of absolute strategic inferiority at the start of this period, the Soviet military sought by various means to negate the US advantage while working out means and methods of using the new weapons of destruction. In 1954 the National Air Defense Forces were upgraded to an independent branch of service with their own CinC who also served as a Deputy Minister of Defense.¹⁵

At the height of the Khrushchev era Soviet military theorists recast Soviet military strategy along lines which emphasized the massed employment of the new weapons of mass destruction. In 1959 a new branch of service, the Strategic Rocket Forces, was created.¹⁶ And in the same year a group of authors at the Voroshilov General Staff Academy authored the first study of military strategy by Soviet authors since A. A. Svechin's had appeared in 1926. In 1962 a new edition of this work was published under the title Military Strategy under the editorship of Marshal V. D. Sokolovsky, who had been Chief of the

¹⁵ Voennyi entsiklopedicheskii slovar', p. 154.

¹⁶ Kir'ian, Voenno-tekhnicheskii progress i Vooruzhennye Sily SSSR, pp. 256-265.

General Staff when the work was composed. This work summed up the General Staff's assumptions regarding the revolutionary impact of the nuclear-rocket revolution upon military affairs.

Military strategy under conditions of modern war has become the strategy of deep nuclear rocket strikes in conjunction with the operations of all services of the armed forces in order to effect the simultaneous defeat and destruction of the economic potential and armed forces throughout the entire depth of the opponent's territory in order to accomplish the aims of war in a short period of time.¹⁷

The organizational, technological and doctrinal implications of this emphasis on deep nuclear strikes were profound for all combat arms. In the early 1960s, when Khrushchev's enthusiasm for rocket weapons was most influential, it appeared that all other combat arms would assume an auxiliary role in support of the nuclear-rocket strike forces. Ground combat and airborne forces were seen as instruments to be employed after nuclear strikes had disabled the enemy forces. Then tank-heavy ground forces would complete the destruction and occupy important military, economic, and political-administrative regions. The reduced role of ground combat forces in this nuclear-dominated military art was made manifest by the decision in 1964 to abolish the post of CinC Ground Forces, a decision which was reversed in 1967 with the appoint of Marshal I. G. Pavlovsky.¹⁸

Primary emphasis in Soviet aviation was upon those arms which contributed directly to strategic attack and defense. Long-

¹⁷ V. D. Sokolovsky, ed., Voennaia strategii (Moscow: Voenizdat, 1963), 2nd Edition, p. 19.

¹⁸ Voennyi entsiklopedicheskii slovar', p. 720.

Range aviation was rearmed to carry cruise missiles and so became truly intercontinental for the first time.¹⁹ Frontal aviation, which was configured for the delivery of nuclear weapons in the execution of strategic-operational tasks, found itself challenged by ballistic and cruise missiles of all types. Among the most important targets for Soviet air strikes, top priority went to the destruction of enemy nuclear delivery systems.²⁰ In the late 1950s "Soviet military science concluded that rockets of various types and missions were the basic and most reliable means [of delivery]." ²¹ For the Soviet Air Forces this decision ushered in the missile era. Long-Range Aviation was rearmed with air to surface cruise missiles; fighter aviation was equipped with a first generation of guided air-to-air missiles; and the SAM emerged as a central element of PVO Strany. Its first noteworthy success with the new technology came in May 1960, when an SA-2 shot down a US U-2 reconnaissance aircraft on a mission to overfly Sverdlovsk. A wrecked summit and political embarrassment for the Eisenhower Administration announced the new era.

For the Soviet Air Forces this incorporation of missile technology brought a radical reorganization of air assets and a reformulation of operational art. "Under these new conditions the

¹⁹ P. S. Kutakhov, Voenno-vozdushnye sily (Moscow: Voenizdat, 1977), p. 54.

²⁰ Kir'ian, Voenno-tekhnicheskii progress i Vooruzhennye Sily SSSR, pp. 253-254.

²¹ Kir'ian, Voenno-tekhnicheskii progress i Vooruzhennye Sily SSSR, p. 264.

air offensive as a form of employment of aviation, which was characteristic for the Great Patriotic War, lost its significance."²² With the integration of the nuclear weapons and missile technology air tactics underwent a radical shift in which massing of forces gave way to massing of fire. The very concept of "command of the air [gospodstvo v vozdukhe] lost its significance under the impact of nuclear-rocket weapons. "In place of the struggle for command of the air the task of a decisive struggle with the enemy's means of nuclear attack through the destruction of his rocket and air groupings of forces appeared."²³

One key indicator of this shift was the reorganization of Soviet Naval Aviation in the late 1950s, when it was stripped of all fighter and attack aircraft and concentrated its efforts on the execution of two key missions: destruction of US aircraft carriers using long-range, missile armed aircraft, and anti-submarine warfare, using fixed-wing and helicopter assets. This decision went hand-in-hand with decisions to arm Soviet submarines with ballistic missiles, to equip surface combatants with surface-to-surface missiles, and to rely upon SAMs and AAA to provide air defense for surface combatants now forced to operate

²² S. A. Krasovsky, ed., Aviatsiia i kosmonavtika SSSR (Moscow:Voenizdat, 1968), p. 349.

²³ Ibid., p. 350.

further from Soviet home waters in their struggle with US nuclear delivery platforms. ²⁴

For Frontal Aviation the new nuclear-rockets seemed to provide more effective means of executing the most crucial missions in a modern war dominated by nuclear weapons. On the other hand, the development of aviation technology, especially super-sonic bombers, meant that such aircraft were less effective in the role of close air support over the battlefield. At the same time attack aviation no longer could answer the new requirements. Thus, attack aviation [shturmovaya aviatsiia] gave way to a new type of aircraft, the fighter-bomber [istrebitel'-bombardirovshchik], which first appeared in 1958. P. O. Sukhoi's Su-7b, the first aircraft of this type, entered production as a fighter but was quickly adapted to the new role.²⁵

Development of the US strategic air threat in the form of SAC's manned and unmanned aircraft did lead to greater assets being invested in PVO Strany. During the late 1950s and early 1960s Soviet SAM weaponry appeared in ever larger numbers and became an integrated part of a national system of air defense. In addition to the application of operations research techniques to the modeling and management of the air defense operation, Soviet

²⁴ Jacob W. Kipp, "Soviet Naval Aviation," in: Michael McGwire and John McDonnell, eds., Soviet Naval Influence: Domestic and Foreign Dimensions (New York: Praeger Publishers, 1977), pp 208-209.

²⁵ Vaclav Nemecek, Sowjet-Flugzeuge (Steinebach-Woerthsee: Luftfahrt-Verlag Walter Zuerl, n.d.), p. 112.

PVO Strany emphasized a combined-arms approach that linked together a new generation of interceptors and fixed-site SAM systems. Gradually the Soviets began exploring SAM systems optimized for long-range, mid-range and short range interception at high and low altitudes and developed more advanced fixed, semi-mobile, and mobile systems. Radio-electronic warfare and centralized troop control figured prominently in its solutions to the existing air threat.²⁶

The Soviet fixation on a single nuclear - war-fighting posture lasted from roughly 1955 to 1964 and corresponded with the Khrushchev era. Khrushchev himself, although by no means a military expert, exercised a profound influence in pressing such views in the face of powerful institutional interests within the Soviet Armed Forces and against the doubts and criticisms of Soviet military theorists associated with the General Staff.²⁷ Colonel General M. A. Gareev, twice hero of the Soviet Union and a shturmovik pilot during the final period of the Great Patriotic War, has recently argued that the critics were right and that in evaluating the impact of nuclear weapons the Soviets military theorists, who supported Khrushchev's one-sided emphasis upon nuclear-rocket weapons, went too far in dismissing the relevance

²⁶ Ibid., p. 266.

²⁷ Nikita Khrushchev, Khrushchev Remembers: The Last Testament (New York: Bantam Books, 1976), pp. 16-29, 44-56, 250-262; and Oleg Penkovsky, The Penkovsky Papers (New York: Doubleday & Company, 1965), pp. 252-257.

of existing military theory and praxis, especially that of the Great Patriotic War.²⁸

III. THE RE-EMERGENCE OF FRONTAL AVIATION

This singled-minded emphasis on nuclear war-fighting capabilities did not go without challenge. Military Strategy went through three revisions in six years. In response to the US formulation of "flexible response" in the first years of the Kennedy Administration, Soviet authors began to address the possibility that a major war between the capitalism and socialism might involve an initial conventional period of undetermined length. By 1968 the certitude about the immediate and decisive role of nuclear-rocket strikes in such a war gave way to a question.

But in essence, the argument is about the basic method of conducting a future war: will it be a land war with the use of nuclear weapons as a means of supporting the operations of ground troops, or a war that is essentially new, where the main means of solving strategic tasks will be the nuclear-rocket weapon? The theory of military art must give an answer to such important questions as: what types of strategic actions will be used in a nuclear war, and what form must military operations take.²⁹

Even prior to this admission of doubt some Soviet authors had reasserted the need to address these issues within the context of prior military experience, especially that of the Great Patriotic War. These authors, who included Marshal M.

²⁸ M. A. Gareev, M. V. Frunze -- voennyi teoretik (Moscow: Voenizdat, 1985), pp. 238-239.

²⁹ Sokolovsky, Voennaia strategiiia (Moscow: Voenizdat, 1968) 3rd Edition, p. 289.

Zakharov, Chief of the General Staff for much of the 1960s, reasserted the relevance of the theory of deep operations as developed in the 1930s and applied during the Great Patriotic War. Numerous works on these subjects began to appear in the mid 1960s.³⁰

For Frontal Aviation this marked the beginning of its recovery. While some Soviet theorists had seen rocket forces replacing Frontal Aviation, Major General of Aviation S. Sokolov addressed the role of Frontal Aviation in support of ground forces by calling for an "alliance" between the rocket forces and Frontal Aviation in which the two were used to provide mutual support for each other. Sokolov envisioned a division of labor in which each branch was used under conditions favorable to it. Frontal Aviation's primary advantage lay in its ability to maneuver, while the rocket forces could deliver strikes over great distances in very short periods of time. Sokolov reminded his readers of the utility of Frontal Aviation during the Great Patriotic War, when its aircraft won air superiority and delivered telling blows against enemy ground and air forces.³¹

In the new situation brought about the presence of nuclear weapons on the battlefield Sokolov acknowledged that the top priority target was the destruction or suppression of enemy

³⁰ Voprosy strategii i operativnogo iskusstva v sovetskikh voennykh trudakh (1917-1941) (Moscow: Voenizdat, 1965) and M. Zakharov, "O teorii glubokoi operatsii," Voenno-isotricheskii zhurnal, No. 10, (October 1970), p. 20.

³¹ S. Sokolov, "Aviatsionnaia podderzhka sukhoputnykh voisk," Voennaia mysl', No. 7, (July 1965), p. 33.

nuclear delivery systems. Here he saw a role for Frontal Aviation because, while ballistic missiles could attack stationary targets, they were not as effective against mobile ones. Thus, Frontal Aviation, equipped with cruise missiles, could strike such targets with greater chance of success. He did not, however, confine Frontal Aviation to that mission. In more general terms, he identified two groups of missions for Frontal Aviation:

The first are general-frontal missions. They include: aerial reconnaissance over the entire depth of the enemy's operational dispositions; the struggle with enemy aviation on the airfields and with their rockets at their launchers to operational depth; the destruction of enemy nuclear-rocket weapons; cover of troops and rear services from enemy air strikes; the struggle with the enemy's deep reserves, and other.

The second mission (group of missions) are fulfilled by Frontal Aviation in operational or tactical cooperation with the ground forces for their support in the course of battles against an enemy with which they have direct contact. This includes: the destruction of nuclear-rocket weapons at tactical or near-operational depths; the destruction or suppression of the enemy's means of electronic warfare and command and control points on the axis of the offensive of a given operational or tactical grouping of forces, the illumination of a local or the placement of marker lights for support of the combat actions of the ground forces at night, and occasionally individual sorties with the objective of aerial reconnaissance. This mission is fulfilled, as a rule, in accordance with the plan of the all-arms strategic formation (operational formation).³²

Taken together, these two sets of missions represented a reformulation of the concept of the air offensive but with a crucial difference. Whereas during the Great Patriotic War the air offensive had been executed by an air army according the plan

³² Ibid., p. 34.

of the Front commander, the new circumstances demanded strict centralized control of all air assets to coordinate the air operation throughout an entire theater.³³ At the same time, Sokolov flatly stated that the new fighter-bombers could not provide the direct close air support for ground units in their advance. He left this role to the new rocket weapons and assigned the fighter-bombers to "free hunting" missions in the enemy rear, where they would work closely with air reconnaissance assets. The nuclear-tipped rocket had replaced the shturmovik, but it could not provide effective fire support during an initial conventional phase.³⁴

This situation became all the more pressing when Soviet military theorists began to address the problem of the initial period of war and the experience of modern air combat in local wars. While nuclear weapons still dominated the structure and organization of the various services, Soviet military theorists began to explore a dual track option, which would permit forces to fight conventionally and to shift to nuclear employment if the need arose. These doctrinal requirements radically exceeded what Soviet forces planners could deliver in the 1960s, but they provided an agenda to guide the modernization of Soviet combat arms and support services into the next decade.

One of the first indications of this new agenda for the Soviet Air Forces was the Domodedovo Air Show of July 1967 when

³³ Ibid., 36-37.

³⁴ Ibid., pp. 33-36.

the Soviets unveiled a new generation of aircraft, reflecting a renewed commitment to Soviet Frontal Aviation and combined arms doctrine. On that July 9th, Day of the Air Fleet, the Soviets displayed a new generation of fighter with variable geometry wings, vertical takeoff and landing aircraft, and short take-off and landing aircraft.³⁵ The new models of even conventional aircraft, including the Su-17 (Fitter-C/D), represented a substantial improvement over the earlier generation of fighter-bombers because of increased weapons load, more powerful engines, and the addition of an ECM pod to increase its ability to penetrate enemy radar and strike deeper targets. Foreign observers noted the increased combat capabilities of these aircraft in non-nuclear wars. In 1968 Colonel N. Semenov reintroduced the term command of the air to the Soviet military lexicon and flatly stated the exact same point:

It is becoming quite obvious from the above [a discussion of the increased capabilities of modern aircraft] that the necessity of gaining air supremacy in conducting military operations without the use of nuclear weapons in modern conditions is becoming even more acute than in the past. However, it is clear that it will be considerably more difficult to resolve this problem. It will require a re-evaluation of many factors and a different approach to the use of forces and means.³⁶

By the late 1960s the Soviet Union stood in a position where it

³⁵ Yakovlev, Tsel' zhizni, pp. 595-599.

³⁶ N. Semenov, "Gaining Supremacy in the Air," Voennaia mysl' No. 4, (April 1968) as translated by FPD 0052/69 in: \Joseph D. Douglass, Jr. and Amoretta M. Hoeber, Selected Readings from "Military Thought," 1963-1973 Studies in Communist Affairs Volume 5, Part 1 (Washington, DC: GPO, 1982), p. 203.

might explore whether such a conventional option was militarily feasible.³⁷

The 1970s had been a decade devoted to securing an invulnerable strategic capability which would provide the Soviet Union with strategic parity, thus negating US strategic superiority at the outset of the decade. This situation in turn undermining the symmetrical logic of "flexible response" and "forward defense" in NATO by undercutting the rationality of the conventional - theater-nuclear - strategic linkage, which was the keystone of NATO doctrine and the foundation of its force structure. For the Soviets this was the military context of the era of detente between East and West. According to Soviet authors, NATO acknowledged this situation officially in 1978, although US pressure upon its allies in 1977 to increase defense spending was a clear indication of the dilemma.³⁸ NATO sought a solution to the problem of Soviet/WTO conventional superiority in the context of superpower strategic parity through modernization of its own theater-nuclear forces. The Soviets, while modernizing both their strategic and theater-nuclear arsenals, looked to enhanced conventional capabilities as a viable path to keeping the military instrument as a rational extension of politics.

IV FRONTAL AVIATION AND THE CONVENTIONAL THEATER-STRATEGIC OPTION

³⁷ Lynn Hansen, "The Resurgence of Soviet Frontal Aviation," Strategic Review, (Fall 1978), pp. 73-74.

³⁸ V. Meshcheriakov, "Osnovye etapy razvitiia ob'edinennykh vooruzhennykh sil NATO," Voenno-istoricheskii zhurnal, No. 1, (January 1984), pp. 77-80.

The Soviet approach to a conventional solution to the problem of using military power in the context of strategic nuclear parity implied a commitment to use conventional means to shift the theater-nuclear correlation of forces in favor of the USSR and its allies, while seeking military decision by the application of conventional military power through the operational application of a new generation of weapons technology.³⁹ As recent writings on tactics suggest, Soviet military theorists have not ignored the presence of nuclear weapons but have sought to adjust their force structuring to reflect a search for optimal conventional impact and the ability to shift swiftly to nuclear combat if the situation demanded it.⁴⁰

This posture involved a sweeping investigation of military praxis with three clear foci. First, came the investigation of theater-scale operations in which Soviet theorists looked to their own experience on the Eastern Front as the closest approximation of the scale and intensity of combat which they envisioned. This brought with it a very close examination of the problem of troop control and a consideration of automated systems to aid operational commanders in conducting modern deep operations. It culminated in the emergence of the concept of the

³⁹ N. V. Ogarkov, Istoriia uchit bditel'nosti (Moscow: Voenizdat, 1985), pp.40-54.

⁴⁰ V. G. Reznichenko, ed., Taktika 2nd edition, (Moscow: Voenizdat, 1984), pp. 14-18,45-71, 91-92.

TVD commander and his headquarters.⁴¹ In operational terms the Soviet theorists began to emphasize the decisive nature of the initial period of war as a means of successfully shifting the correlation of forces and sought means of applying combat power in such a manner, which would preclude enemy recourse to nuclear weapons within the theater and force a decision upon the opponent without either side resorting to weapons of mass destruction. Soviet writings began to emphasize surprise, deception [maskirovka], the tempo of the advance, and the employment of mobile groups at operational depths (operational maneuver groups).⁴² The Soviets employed such an operational maneuver group for the first time during ZAPAD 81.⁴³

The second source of military praxis which Soviet theorists examined in their search for a conventional option was the experience of the local wars of the last two decades. In Vietnam the Soviets observed that US problems with close air support and

⁴¹ For an excellent discussion of this topic see: Michael McGwire, Military Objectives in Soviet Foreign Policy (Washington, DC: The Brookings Institution, 1987), pp. 117 ff.

⁴² On these developments see: S. V. Ivanov, ed., Nachal'nyi period voyny (po opytu kampanii i operatsii Vtoroi Mirovoi voyny (Moscow: Voenizdat, 1974), pp. 4-22; M. M. Kir'ian, Vnezapnost' v operatsiakh vooruzhennykh sil SShA (Moscow: Voenizdat, 1982); V. G. Reznichenko, ed., Takitika 2nd edition (Moscow: Voenizdat, 1984), pp. 152-173; and N. V. Ogarkov, Istoriia uchit bditel'nosti (Moscow: Voenizdat, 1985), pp. 76-90.

⁴³ Jeffrey Simon, Warsaw Pact Forces: Problems of Command and Control (Boulder, Colorado: Westview Press, 1985), pp. 192-194. For the best discussion of the OMG see: Christopher Donnelly, "The Soviet Operational Maneuver Group: A Challenge for NATO," Military Review, LXIII, No. 3, (March 1983), pp. 43-60.

the search for solutions. On the one hand, this involved the emergence of the helicopter as a combat weapon.⁴⁴

Soviet interest in helicopters dated back to the prewar period when they had pursued both autogiro and helicopter technology. In the postwar period the machines designed by Igor Sikorsky in the United States served as an inspiration for the first generation of Soviet machines and by the 1950s the Soviet acknowledged the military applications of helicopter technology, including a substantial attention to heavy lift vehicles, i. e., the Yak 24 and Mi-6.⁴⁵ Vietnam and the earlier French employment of armed helicopters in Algeria, opened up the possibility of creating armed versions. The initial Soviet response was to add weapons pods to the Mi-8T, which went into production in 1966.⁴⁶ This short-term solution was followed by the development of a strictly military helicopter designed for air assault and fire support missions, the Mi-24 Hind, which first flew in the early 1970s and went into series production in 1972. The Mi-24 has since undergone numerous modifications to make it more effective as a close fire support system against enemy armor and infantry.

With its appearance the Soviet aircraft industry provided the armed forces with its first truly close air support tool since the 1950s. This air-assault - attack aircraft [desantno-

⁴⁴ Kir'ian, Nauchno-tekhnicheskii progress i Vooruzhennye Sily SSSR, p. 284; and I. E. Shavrov, ed., Lokal'nye voyny: Istorii i sovremennost' (Moscow: Voenizdat, 1981), pp. 252-253.

⁴⁵ Krasovsky, Aviatsiia i kosmonavtika SSSR, pp. 324-325.

⁴⁶ Gunston, Aircraft of the Soviet Union, pp. 196-197.

shturmovik] has continued in production for over a decade with more than 2300 in military service by mid-1983 and many more being exported around the world.⁴⁷ Hinds are organized into squadrons (18 machines) and provide direct close air support assets to division, army and front commanders. Army and Front commanders also have available to them air assault units, which range from air assault and air mobile assault brigades and an airborne division at front level to an air assault battalion with tank and combined arms armies. These air assault/air mobile forces have been widely used in Afghanistan in conjunction with Hind attack helicopter squadrons, and have proven a deadly foe for the Mujahideen. There is even some evidence that the Soviets have sought to adapt the Mi-24 to anti-helicopter operations.⁴⁸

At the present time the Soviets have under development a successor generation of helicopters, with improved close air support and anti-helicopter capabilities. These include the Mi-28 Havoc and Kamov's Ka-? Hokum, which some Western observers have identified as helicopter optimized for air-to-air combat. This development goes hand-in-hand with a radical improvement in the lift capability of Soviet transport helicopters, especially the

⁴⁷ Ibid., pp. 200-202.

⁴⁸ Krasnaia zvezda, (January 24, 1984), p. 1; and "Takticheskaya zadacha," voennyi vestnik, No. 5, (May 1986), p. 32 and "Razbor reshenii takticheskoi zadachi," Voennyi vestnik, No. 10, (October 1986), pp. 16-17. Soviet authors have also analyzed Western writings on the helicopter in aerial combat. See: M. Fesenko, "Vertolet protiv vertolet," Aviatsiia i kosmonavtika, No. 3, (March 1984), pp. 46-47.

Mi-26 Halo, which can carry 20 tons at a cruising speed of 158 mph.⁴⁹

Local wars in Vietnam and the Middle East pointed out five other crucial problems with which Soviet Frontal Aviation and Air Defense Forces had to deal. First came the recognition that the decision to go with fighter-bomber aircraft as a universal type had created platforms unsuited to either role.⁵⁰ This recognition led to a shift back towards aircraft optimized for fighter, interdiction, and close-air support missions.

The second problem concerned the transformation of modern, high-performance aircraft into effective close support and interdiction systems against enhanced air defense forces. This led to an investigation of precision-guided munitions, which reduced air losses and radically increased the probability of

⁴⁹ Bill Gunston and Mike Spick, Modern Fighting Helicopters (New York: Crescent, 1986), pp. 76-77, 144-147. Like all other Kamov helicopters, Hokum appears to have a coaxial rotar system very different from the Mil OKB's Hind or Havoc. The superiority of such a rotar system for an aerial combat environment in terms of direct shaft-to-lift power, ability to climb and descend rapidly, and maneuver swiftly by using control surfaces as against a tail rotar must be judged against the problem of rotar fouling during turns and banks when the blades are under dynamic loading. In looking at the helicopters built by Mil's OKB and the park of helicopters around the world, A. M. Volodko and A. L. Litvinov pointed out recently that conventional rotar - tail-rotar ships seem to have considerable advantages over coaxial type helicopters. It is still unclear whether the Kamov OKB has made such a breakthrough and that a new generation of coaxial interceptor-helicopters has arrived. On the Mil approach see: A. M. Volodko and A. L. Litvinov, Osnovy konstruktsii i tekhnicheskoi ekspluatatsii odnovintovykh vertolotov (Moscow: Voenizdat, 1986), pp. 3-24.

⁵⁰ Iu. Kisliakov and V. Dubrov, "Novye cherty vozdushnogo boia," Aviatsiia i kosmonavtika, No. 11, (November 1984), p. 14.

destroying ground targets.⁵¹ The Soviets developed their own first-generation, smart weapons and acquired a fourth generation of jet aircraft to deliver them, including a fixed-wing ground attack plane [shturmovik], the Su-25 Frogfoot A.⁵²

The third issue, raised by air combat in local wars, related to the development and employment of modern air defense systems. The Soviets were in an obvious position to recast their air defense concepts on the basis of the experience of Vietnam, the Arab-Israeli Wars of 1967 and 1973, and the Israeli invasion of Lebanon in 1982. All these conflicts underscored the need for a combined-arms approach to air defense, where SAMs, AAA, and interceptors were forged into an integrated air defense system with increased maneuver capabilities so that its forces could be regrouped so its forces could perform new tasks in the course of an operation or during a subsequent operation.⁵³

The local wars provided a stimulus for a fresh look at the air defense of ground forces employing both active and supporting means.⁵⁴ This problem in conjunction with the appearance of a new

⁵¹ Kir'ian, Voenno-tekhicheskii progress i Voorushennye Sily SSSR, pp. 287-288; and V. A. Sokolov, "Razvitie taktiki istrebitel'no-bombardirovshchikov v lokal'nykh voynakh, Voenno-istoricheskii zhurnal, No. 4, (April 1986), pp. 65-72.

⁵² Bill Sweetman, "Sukhoi Su-25 Frogfoot," International Defense Review, No. 11, (November 1985), pp. 1759-1762.

⁵³ V. K. Strel'nikov, "Razvitie sredstv PVO i opyt ikh primeneniia v lokal'nykh voynakh," Voenno-istoricheskii zhurnal, No. 5, (May 1986), pp. 62-67.

⁵⁴ Iu. A. Andersen, A. I. Drozhzhin, and P. M. Losik, Protivovozdushnaia oborona sukhoputnykh voisk (Moscow: Voenizdat, 1979), pp. 72-73.

generation of cruise missiles with enhanced flight and target acquisition capabilities led to a reorganization of Soviet Air Defense Forces with a shift in assets away from those dedicated to the strategic mission of homeland defense (a decline in the number of heavy interceptors over the last fifteen years with a rise in the number of fighters suited for forward air defense and the struggle for air superiority) and towards combined arms employment with Frontal Aviation in support of deep operations.⁵⁵ The appearance of the MiG 29 Fulcrum with STOL capability and advanced avionics and weapons seems to fit in with this shift as well.⁵⁶

The fourth problem, which the experience of local wars brought into sharp relief, was the question of air combat tactics. The improvement of stand-off weapons for middle-distance combat, the development of ever-more sophisticated means of electronic warfare, and the performance characteristics of third generation jet aircraft in close combat forced the Soviets to re-

⁵⁵ On the abolishment of PVO Strany and the reemergence of Voiska PVO as a force designed to provide forward air defense and support of theater-strategic operations see: Russell G. Breighner, "Air Defense Forces," in: David Jones, ed., Soviet Armed Forces Review Annual (Gulf Breeze, Florida: Academic International Press, 1984), VII (1982-1983), pp. 158-176.

⁵⁶ Georg Panyalev, "MiG 29 Fulcrum: Details to Date," International Defense Review, No. 2, (February 1987), pp. 145-147.

examine the problem of air-to-air combat and the superiority of the two-plane "flight" as the optimal tactical formation.⁵⁷

In all these areas the local wars of the last three decades have provided the Soviets with valuable data on tactical problems relating to the new technologies which have been developed for air combat and allowed Soviet theorists to address the critical problems which such changes create for cooperation [vziamodeistvie] at the tactical and operational levels of war. Afghanistan since 1979 has provided valuable practical experience in the application of Frontal and Army Aviations in tactical situations.

The third focus of Soviet efforts to develop the concepts and force structures for the execution of theater-strategic operations has been their own exercises and war games.⁵⁸ In this area that they have tried to use such exercises and maneuvers for the training of troops as well as adapting their concepts and force structure to the demands of combined arms and joint cooperation [vziamodeistvie] on the modern battlefield.⁵⁹ During ZAPAD 81 the Soviets employed an operational-maneuver group with

⁵⁷ Kisliakov and Dubrov, "Novye cherty vozdushnogo boia," Aviatsiia i kosmonavtika, No 9, (September 1984), pp. 12-14; No. 10, (October 1984), pp. 30-31; No. 11, (November 1984), pp. 13-15; and No. 12, (December 1984), pp. 30-32.

⁵⁸ I. E. Shavrov and M. I. Galkin, Metodologiya voenno-nauchnogo poznaniia (Moscow: Voenizdat, 1977), pp. 398-399.

⁵⁹ M. A. Gareev, Takticheskie ucheniia i manevry (Istoricheskie ocherki) (Moscow: Voenizdat, 1977), 5-7, 261-263.

helicopter air assault and fire support to test the concept's effectiveness as part of their theater-strategic operation.⁶⁰

Soviet authors have been quite explicit about the critical role of the air operation in their conception of such theater-strategic operations. Command of the air over the main axes of advance has been directly associated with the need to blast air corridors through enemy air defense assets. This process Soviet authors have linked to the struggle for air superiority and the anti-air operation:

Questions of the preparation and conduct of the air operation for gaining command of the air, conducted with the purpose of destroying the enemy aviation grouping on specific axis, have been worked out.⁶¹

The basis of the anti-air portion of this operation was the assumption that the best means of air defense was the destruction of enemy air assets on the ground.⁶²

At the same time, Soviet authors have stressed the fact that winning the electronic battle is indispensable to the success of such air operations. This was one of the central lessons which they drew from both the Israeli Invasion of Lebanon and the

⁶⁰ Jeffrey Simon, Warsaw Pact Forces: Problems of Command and Control (Boulder, Colorado: Westview Press, 1985), pp. 192-194.

⁶¹ M. M. Kir'ian et al, Istoriia voennogo iskusstva (Moscow: Voenizdat, 1986), p. 404.

⁶² Andersen, Drozhzhin and Lozik, Protivovozdushnaia oborona sukhoputnykh voisk, p. 71.

Falklands War.⁶³ The Soviet approach to the theater-strategic operation as a conventional option remains true to the classic terms of Soviet deep operation theory in its emphasis upon a combined-arms approach and the integration of new means of striking into the enemy's operational rear. The partnership which developed between Frontal Aviation and Soviet Rocket Forces has not been abandoned under this new situation. Instead, the Rocket Forces have been equipped with a new generation of conventional warheads which will allow them to attack stationary targets with an effect similar to that of small tactical nuclear weapons of a generation ago.⁶⁴

V. CONCLUSION

Some authors have compared this Soviet approach to the adaptation of modern combat means with Blitzkrieg warfare.⁶⁵ Others, most notably the late Richard Simpkin, have seen these developments as a "search for simultaneity throughout the depth of the defense," in which the Soviets are backing heavily upon

⁶³ S. V. Seroshtan, "Radioelektronnaia bor'ba v lokal'nykh voynakh na Blizhnem Vostoke," Voenno-istoricheskii zhurnal, No. 3, (March 1985), pp. 62-67; and R. Loskutov and V. Morozov, "Nekotorye voprosy taktiki vooruzhennogo konflikta v Livane v 1982 godu," Voenno-istoricheskii zhurnal, No. 7, (July 1984), pp. 75-78. On the Soviet analysis of the Falklands Conflict see: Jacob W. Kipp, Naval Art and the Prism of Contemporaneity: Soviet Naval Officers and the Falklands Conflict (College Station, Texas: Center for Strategic Technology, Texas A & M University, 1984).

⁶⁴ Kerry L. Hines, "Soviet Short-Range Ballistic Missiles: Now a Conventional Deep-Strike Mission," International Defense Review, No. 12, (December 1985), pp. 1909-1914.

⁶⁵ P. H. Vigor, Soviet Blitzkrieg Theory (London: The Macmillan Press, 1983), pp. 1-9.

air-mobile, mechanized forces to support their mobile groups in high-speed, offensive operation. Simpkin expressly linked this approach to new potentialities which were emerging as a result of developments in helicopter aviation, which he termed as nothing less than a "rotary revolution" as profound in its implications as that associated with the mechanization of warfare in the 1930s. Simpkin saw this search for simultaneity as on-going, unrealized, but thoroughly in keeping Soviet operational art as it was developed in the 1920s and 1930s by Tukhachevsky and his colleagues.⁶⁶ Frontal Aviation has a critical role to play in such operations in cooperation with other arms and services. For all the technological changes and developments, its role still fits within that outlined by A. N. Lapchinsky in Vozdushnaia Armiia on the eve of World War II when he said: "In order to conduct a maneuver war, one must win the air-land battles which begin in the air and culminate in victory on the ground and this requires the concentration of all air forces at a given time on a given front."⁶⁷ For all the technological changes and

⁶⁶ Richard Simpkin, Race to the Swift: Thoughts on Twenty-First-Century Warfare (London: Brassey's Defense Publishers, 1985), pp. 145-161.

⁶⁷ A. N. Lapchinsky, Vozdushnaia armiia (Moscow: Gosvoenizdat, 1939), p. 144.

organizational innovations, a core element of doctrinal continuity remains.⁶⁹

⁶⁹ In assessing trends in the development of ground force tactics into the twenty-first century Colonel Stanislaw Koziej of the Polish People's Army identified one the the basic direction of such changes as "the transformation of traditional land combat into air-land combat" This he explicitly associated with the development and introduction of precision weapons and helicopters on an increasingly broader scale, as well as the rapid tempo of electronization and automation of the basic processes of armed combat." See: Stanislaw Koziej, "Przewidywane kierunki zmian w taktyce Wojsk Ladowych," Przeglad Wojsk Ladowych, No. 9 (September 1986), p. 9.

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